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Eliot, Francis Perceval

Letters on the political and financial situation of...

[London?]

1814

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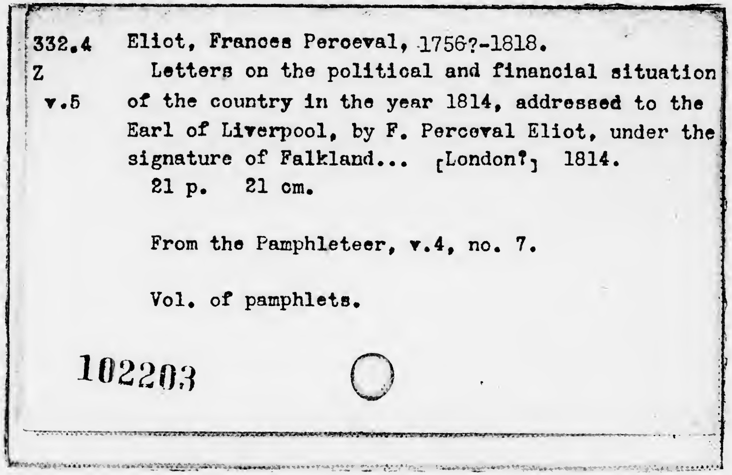

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LETTERS

ON THE

Political and Financial

SITUATION OF THE COUNTRY

IN THE YEAR 1814;

ADDRESSED TO

THE EARL OF LIVERPOOL.

By F. PERCEVAL ELIOT, Esq.
UNDER THE SIGNATURE OF FALKLAND.

The former Letters are inserted in our last number. No. I. should have been dated 31st January, 1814. No. II. 9th February, 1814. No. III. 23d February, 1814. No. IV. 29th March, 1814, and No. V. 10th May, 1814.

1814.

LETTERS,

&c. &c. &c.

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LETTER. VI.

20th June, 1814.

My Lord,

Released from the anxious and important duties so necessarily attendant on a state of warfare; and of such a war as that which is now so happily and gloriously terminated—with the exception of those international exchanges, indemnities, and restorations, on which a general congress alone seems to be competent to decide satisfactorily and permanently; and excepting also the necessary care of distributing due rewards, and the means of subsistence to the numerous naval and military servants of the public, who, under whatever commanders, have served you so valiantly and so effectually——

> " His saltem longi, non cum duce, præmia belli
> " Reddantur;—miles sub quolibet iste triumphet.
> " Conferet exanguis quò se post bella senectus?
> " Quæ sedes erit emeritis? quæ rura dabuntur,
> " Quæ noster veteranus aret? quæ mænia fessis?"
>
> Lucan.

With these reservations, which can only employ your attention for a short time, at most a few months, your lordship will have leisure to consider the necessary measures to be taken for increasing the strength, improving the revenue, reducing the debt, husbanding the resources, and promoting the general prosperity of the empire, during that peaceable repose so nearly approaching, and which, I trust, will be of such long endurance.

Amongst these the encouragement of agriculture will be a main and leading object; for, though I do not go so far as to agree either with those, who look upon the produce of the farm as all in all, and despise commerce; or on the other hand with those, who would sacrifice the landed to the mercantile interest; because I am well convinced that the welfare of both is best supported, and the public prosperity most substantially promoted, by the reciprocal assistance received by each of them from the other—yet I am perfectly prepared to assert that an improving state of agriculture ought to be a primary object with every wise statesman, as leading to an increased population and augmented public strength both political and financial; and as that source of advantage and profit which is most permanently independent of external chance or control, by which the most lucrative branch of foreign trade may, at any time be cut off in a moment.

I concur, therefore completely, my lord, with your right honorable friend, the Chancellor of the Exchequer, in supporting the resolution for unlimited export in the corn trade; increased demand being the surest means of creating increase of produce, wherever such increase is producible at will, as it is in the case of corn; though quite the contrary with respect to bullion, where it is out of our power to open a single additional mine of silver, though we may plough up a thousand more fields for wheat.

But with the consideration of quantity, the question of quality is also a mainly preponderating point in the culture of corn; the production of the greatest proportion of nutritive farina with the smallest quantity of husk, and from the most limited extent of land, being evidently of equal benefit to the grower, the consumer, and the public. I enter fully, therefore, into the recommendation of the Committee of the House of Lords in 1800 to the Committee of Privy Council, for considering the propriety of selling corn by a combination of weight and measure. I have not a shadow of doubt on that head myself; weight is the only true standard of the quality of corn; the heaviest wheat in the smallest compass will always yield the greatest proportion of nutritive product; and the millers are so well aware of this, that in the Staffordshire markets, (to which I have been most accustomed,) they always stipulate for a nominal measure to be made up to a certain specified weight; generally (but not invariably) the Staffordshire bag of three strikes, of nine Winchester gallons each, to weigh 210lbs. avoirdupoise, or 70lbs. per strike. Thereby evidently making it the interest of the farmer to grow the heaviest and finest corn; which can only be done by keeping his land in high condition; beggarly land always producing lean half-starved grain. And in doing this they are also insensibly contributing to a great national benefit; as all judges of agriculture know that of two tenants farming an equal quantity of similar land, and applying only the manure raised on the farm, the one who sows only three tenths with wheat or on an average of seasons, will grow as much bread corn in quantity, (and of a very superior quality,) as the other who sows five or six tenths; with the important addition of two or three tenths more of his farm in grass land, in high condition for meadow or pasture.

The sale of corn by weight is, therefore, I think highly necessary to be enforced by law; and in order to comply as far as possible with the established customs and prejudices of the growers and dealers in that article, a combination of weight and measure, (in which, however, the former is to be the legal and preponderating standard,) will probably be found most efficient and practicable. The vast variety of both measures and weights which have acquired a sort of local usurpation over those established by the statutes, demand, as a primary step, the banishment of all such irregularities, and the establishment of one uniform weight and one measure; capable not only of almost infinite division or accumulation, each in itself, but also corresponding with the other in its several proportions; simplified at the same time, as much as the practical necessity of division will allow. I have given much time, and no inconsiderable labor of thought to this desideratum; and the result of my inquiries is exemplified in the subjoined tables; the communication of which cannot, probably, be submitted to your lordship at a more appropriate time than the present, when the two questions of corn, and of weight and measure, are both likely to engage the attention of the legislature during the existing session.

In order to evince the superior simplicity and general usefulness of these tables, it is necessary first to lay before you a sketch of the different proportions which have, at divers times, been authorised by the several acts of the legislature, as well as of those given by the principal writers on this subject; and of the improprieties in the existing weights and measures as at present established by law, and the irregular deviations from them, which have obtained a local, though illegal, kind of prescription in the provincial markets. And, secondly, on these data to form a series of calculations, from which may be established, as a general deduction, the superior utility of the weights and measures proposed.

In the first place, then, the 27th chapter of Magna Charta, declares that the weights all over England are to be the same; but (in my opinion very unnecessarily,) gives for different sorts of commodities, two different sorts of weights, troy and avoirdupoise. The pound troy consisting of 12 ounces; each ounce of 20 pennyweights; and each pennyweight of 32 grains of wheat gathered in the middle of the ear, and well dried. This weight, established by the 51st Henry III. was confirmed by the 31st Edward I. and 12th Henry VII. It is said that this pound had obtained general usage from the Conquest; and again it is said that Henry VII. altered the old English weight, and introduced a pound troy, weighing three-quarters of an ounce more than the Saxon pound; and the 18th Henry VIII. abolished the Saxon pound, establishing that of Troy; which as before mentioned, exceeded it by three-quarters of an ounce. The pennyweight has since been divided into twenty-four equal parts, called grains, and therefore weighing $1\frac{1}{3}$ grain of wheat each. Dr. Hutton, however, estimates the grain troy, at one and a half of wheat. The pound avoirdupoise, which from its more general utility, has every day crept into greater use, is computed by Dr. Hutton to contain $6999\frac{1}{2}$ grains troy; by Ferguson (in his Lectures on Mechanics) 7000 ditto; and by the academies of London and Paris, 7004 ditto. Of these different, but not greatly varying, computations, I have thought it best to take the average. There is much confusion in these accounts; and I do not know any writer who can clear them up; neither is it of any particular consequence; it is sufficient for our purpose to know the present establishments and their errors. The first statute that appears to legalise avoirdupoise, is 24th Henry VIII.

and therein it is only directed to be used for weighing butchers' meat in the market; when it came into private use is not known.

In dry measure, the following inconsistencies take place. The brass bushel of Henry VII. found in the Exchequer in 1688, contained 2145 cubic inches; and it being known by experience, that 1728 cubic inches of wheat weigh $58\frac{17}{576}$ pounds troy, the above bushel will, therefore, contain 72 pounds troy of wheat; or 9 gallons weighing 8 pounds, and measuring $238\frac{1}{3}$ cubic inches each. But according to Greaves, in his origin of weights and measures, this same bushel, when filled with common spring water, and measured before the House of Commons in 1696, was found to contain $2145\frac{6}{10}$ cubic inches, and the water being weighed was equal to 1131 ounces and 14 pennyweights, or 94 pounds, three ounces and 14 pennyweights troy. The Winchester gallon measuring $272\frac{1}{4}$ cubic inches, is to contain 9 pounds, 13 ounces avoirdupoise. But the Winchester bushel legalised in 1697, is to measure $18\frac{1}{2}$ inches in diameter, and 8 inches in depth, and therefore contains $2150\frac{42}{100}$ cubic inches; and its corresponding gallon should be $268\frac{8}{10}$ inches. The standard wine gallon is computed at 231 cubic inches, and to contain 8 pounds avoirdupoise of water; but it was found by actual admeasurement, before the Lord Mayor and Commissioners of Excise in 1688, to contain only 224 cubic inches. Were I, indeed, to insert the almost numberless variations I have met with in different authors, it would swell my letter to a pamphlet, or rather to a volume.

I shall now, therefore, proceed to direct your attention to the inconsistencies in our present confused system of weights and measures, and then to calculate the proportions between them and the proposed tables. It is hardly necessary to point out the evident inutility of a separate weight for the use of apothecaries, particularly when we recollect that they buy and sell their drugs by avoirdupoise, though they compound them by apothecaries' weight; whose pound is exactly the same as the pound troy; and consists of the same number of grains; differing only in the intermediate divisions: which might have been as well effected by only subdividing the ounce into halves and quarters of ten and five pennyweights each; and the pennyweight again halved and quartered into twelve and six grains; even supposing it at all necessary to retain the pound troy independently of avoirdupoise, which is of so much greater utility, and should therefore be used exclusively. The pound avoirdupoise is already as well divided into ounces and drachms as it can possibly be; but below the drachm, and above the pound, the divisions and multiples should be so altered, as to continue the perfect series of squares and cubes, which can alone secure an infinite regularity.

The absurdity of dividing liquid measure into three distinct, or rather confused, branches, for wine, beer, and ale, is too glaring to detain you long; and the perplexing fractions which run through the whole of them, are equally unnecessary. I should therefore propose, that one simple and uniform measure, raised from the Winchester wine pint of $28\frac{7}{8}$ cubic inches, and containing exactly one pound avoirdupoise of pure water, should be adopted to the exclusion of them all; as will be seen in the table No. 3.

The different variations in dry measure appear in the preceding part of this letter; and I shall, therefore, without repeating them, propose in their place, that all corn shall be sold by weight. The pint (imperial, or any other title which may be thought more appropriate,) to measure $28\frac{7}{8}$ cubic inches, and to be so filled or heaped if necessary, as to contain exactly one pound avoirdupoise weight of wheat; and of other sorts of corn in proportion. The bushel to

measure 1848 cubic inches in solid contents; and to be filled up to 64 pounds avoirdupoise weight of wheat; and so on.

In regard to the provincial irregularities, every member of the House of Commons can tell what deviations have taken root in his own county; for which reason it is hardly worth while to say more on this head, but that some variations obtain in almost every part of the kingdom. I shall, therefore, next proceed to exemplify the series of calculations on which the proportions of the proposed tables are founded. But as these, in order to be made intelligible, must be given at considerable length, and will occupy a much greater space than could possibly be assigned to the remaining limits of this letter, it will be found more convenient to make them the subject of another address to your lordship's judgment.

We have been termed, my lord, a nation of shopkeepers;—be it so—and as we mean to bespeak the custom of the world, let us take pains to convince our customers that we intend to give them good weight and full measure, by way of invitation to our counter. It is with peculiar gratification, that, after the subject had been dropped by so many persons who failed in due perseverance, and the question had been suffered to slumber for so long a period, I find it now resumed in the legislative assembly at an epoch so peculiarly appropriate, as the conclusion of a general peace; when the extension of trade, the revival of manufacture, and, as I hope, the accompanying improvement of agriculture, will necessarily make the correction and simplification of the weights and measures, now so shamefully confused and miserably irregular, an object of extreme importance in your lordship's consideration, from whom, as well as from the other departments of government, I shall trust that it will meet with all due encouragement.

"Ego, autem, quidquid in me est studii, consilii, laboris,
"ingenii, quidquid auctoritate, fide, constantiâ possum, id
"omne ad hanc rem conficiendam tibi et populo Romano
"polliceor et defero."[1]

FALKLAND.

LETTER VII.

28th June, 1814.

MY LORD,

Resuming the subject of Weights and Measures, where I broke off at the conclusion of my last letter, I now proceed to submit to your lordship the series of calculations on which it is proposed to found the proportions of the new tables. Premising first, that the pound avoirdupoise, as it now stands, is proposed to be retained under the name of the pound imperial; (or by whatever other designation you may choose to distinguish it;) and that its drachm is to be subdivided into thirty-two equal parts, to be called grains imperial, each equal to one grain of the largest and heaviest wheat; and 8192 of which will constitute one pound imperial; which grain may also be subdivided again by squaring and cubing &c. as minutely as may be found necessary, in the same perfect series of proportions, for the use of apothecaries, jewellers, and moneyers. Then if—

---

[1] Cicero.

lb.avr.		lb.	oz.	dwts.	gr. troy.			gr. imp.		grain troy.
1	:	1	2	11	$15\frac{1}{2}$	per Hutton	::	1	:	.8543115234375
1	:	1	2	11	16	per Ferguson	::	1	:	.8544921875
1	:	1	2	11	20	per Acads. Lon. Paris	::	1	:	.85498046875
3	:	3	7	15	$3\frac{1}{2}$	Total	::	3	:	2.5637841796875
1	:	1	2	11	$17\frac{1}{6}$	Average	::	1	:	.8545947265625

So as 1 grain troy : $1\frac{1}{3}$ grain of wheat : : $\frac{8515947265625}{10000000000000}$ grain troy = 1 grain imperial : $1\frac{14}{100}$ or about $1\frac{1}{7}$ grain wheat.

Upon the above proportions, which I believe are as near the truth as the variable weight of corn will allow, have I founded the subdivision of the drachm into grains; which, at the same time that it continues the perfect series of squares and cubes, comes nearer than any weight hitherto found out to the actual weight of the corn; or at least to what it ought to, and may be, on land skilfully cultivated. That the present number of ounces in a pound, and drachms in an ounce, being 16, and therefore each the square of 4, the number of its quarters is incontrovertibly the simplest and best, both for arithmetical abstraction, and commercial practice, I have already ventured to assert; and shall, on the same principle, assume 16lbs. to the stone, 8 stones (or 128 lbs.) to the cwt. and 16 cwt. to the ton, as much more correct divisions of the latter, than the present proportions of 14 lbs. to the stone, and 20 cwt. to the ton. The ton imperial containing only 2048 lbs. avoirdupoise, will also be much nearer to the original ton of 2000 lbs. than that in present use, which weighs 2240: at the same time that it avoids all the irregular divisions, which in both the old and present ton were unavoidable.

In regard to dry measure, I have before observed that in its combinations with weight, as more particularly affecting the sale of corn, the latter (weight) is to be the legal and preponderating standard. If, therefore, we can contrive a bushel, whose solid contents shall be nearly equal to its corresponding weight in the combined table, it may be always so filled or heaped (provided the corn is not of a very inferior and unmarketable quality, and therefore unfit for bread-corn,) as to be made fully equal to the proper standard in point of weight. The great diversity of opinion in different writers on this head, starts many difficulties; but such, as I flatter myself, are nevertheless not insuperable. For instance: In the Philosophical Transactions, the following proportion is given:

cub. inc. lbs. troy cub. inc. lbs. troy
As 1728 : $58\frac{17}{576}$ :: 2145 : $72\frac{19}{576}$

lb. av. lb. oz. dwt. gr. troy. lbs. im. = 1bl. lbs. troy.
From whence, if 1 : 1 2 11 $17\frac{1}{6}$ :: 64 $77\frac{599}{1000}$ &c.

lbs. troy. cub. ins. lbs. troy. cub. inches.
Then, as $72\frac{19}{576}$: 2145 :: $77\frac{599}{1000}$: $2311\frac{833}{1000}$ &c.

But according to Greaves, in his origin of weights and measures:

lbs. troy. cub. ins. lbs. troy. cub. inches.
As $94\frac{308333}{1000000}$: $2145\frac{6}{10}$ :: $77\frac{599}{1000}$ &c. : $1765\frac{42669}{100000}$ &c.

So from the first calculation the imperial bushel weighing 64 lbs. avoirdupoise (or imperial) should contain $2311\frac{833}{1000}$ cubic inches, and from the second only $1765\frac{42669}{100000}$. The difference is too great to allow of striking a medium, and the one or the other must be widely erroneous. I am strongly inclined to lean to the latter; because eight standard wine gallons of 231 inches each will constitute a bushel of 1848 cubic inches; and if the gallon is really but 224, then the bushel would contain only 1792. The first of these two last I have, therefore, adopted, and proposed the imperial bushel to contain 1848 cubic inches. But if, on accurate experiment, a measure of pure water weighing exactly 8 avoirdupoise pounds should be found to occupy a greater or lesser space than 231 cubic inches, the solid contents of the gallon may be altered without in the least interfering with the series of weights and measures in the proposed tables; making only the divisions and multiples of the standard measures to correspond in exact proportion of solid contents with the gallon so rectified.

The variations between the present and the proposed dry measures are very trifling: indeed there are none, except the abolition of the weigh and last; which are both so absurdly indefinite in their contents that, in some places, five quarters make a weigh, and two weighs a last; whilst in others they reckon ten quarters to the weigh, and twelve weighs to the last, differing as twelve to one: and, surely, the general adoption of the ton, as uniting in its construction both weight and measure, must tend infinitely to the simplification of terms—a quality of the first import in generalizing the utility of our combined table. The more we can reduce the number of different terms in the several measures, so as to make them appear as one in the combined table, so much the stronger will be the impression of its superior utility; and in real practice, so much the easier will it be learned, and the more perfectly retained by the memory. At present, so great is the confusion, and so perplexing the variations of weight and measure between corn and coals, wool and wheat, ale and wine, beer and ale, that I believe very few gentlemen, and not a great many men of business, if taken unprepared, can recollect the whole of them.

Upon the same principle of simplification, I shall proceed to unite the different branches of liquid: and from the three present measures for wine, ale, and beer, form one plain and simple system of proportions, raised on the present Winchester wine-pint of $28\frac{7}{8}$ cubic inches in solid content, and holding exactly one pound avoirdupoise of pure running water; from whence the gallon of eight pints imperial liquid measure will contain 231 cubic inches, and weigh eight pounds imperial or avoirdupoise. The variations between weight and measure, not only in different liquids, but also in different portions or species of the same liquor, will preclude absolute correspondence in weight and liquid measure: here, therefore, in contradistinction to dry measure, the solid contents, and not the specified weight, must be the preponderating standard. The following are some of the leading proportions given by the several authors, by which my correspondent weights and measures are corroborated.—viz:

A cubic inch of red wine is supposed, in the Philosophical Transactions, to weigh 10 dwts. $11\frac{42}{100}$ grains troy.

	cub.in. red wine.		dwts.	grs.troy.		cub. ins.		lbs.	oz.	dwts.	g.troy
Therefore	1	:	10	$11\frac{42}{100}$	: :	224	:	9	9	6	$14\frac{8}{100}$
And	1	:	10	$11\frac{42}{100}$	: :	231	:	10	1	0	$0\frac{1}{32}$

	lb	oz.	dwts.	gr.tr.		lb.im.		lbs.	oz.	dwts.	g.tr.		lbs.	oz.	dwts.	g.im
Then	1	2	11	$17\frac{1}{6}$	:	1	: :	10	1	0	$0\frac{1}{32}$	:	8	4	11	$24\frac{48}{100}$

which is the weight of a gallon imperial of red wine, measuring 231 cubic inches.

Again; according to Ferguson, the weight of a cubical inch of good brandy, rum or other proof spirits, is $235\frac{7}{10}$ grs. troy; from whence we may say—

	cub. in. spirits.		dwts.	gr. troy.		cub. in. do.		lbs.	oz.	dwt.	gr. troy.
As	,	:	9	$19\frac{7}{10}$	: :	231	:	9	5	8	$14\frac{7}{10}$

	lb.	oz.	dwt.	gr. tr.		lb.im.		lb.	oz.	dw.	gr.tr.		lb.	oz.	dw.	g.im
Then, as	1	2	11	$17\frac{1}{6}$	:	1	: :	9	5	8	$14\frac{7}{10}$	:	7	12	6	$27\frac{5}{10}$

being the weight of one gallon imperial of proof spirits, measuring 231 cubic inches. But as it is also allowed that a cubic inch of brandy will acquire 10 grains of additional weight in summer, let us take the summer weight and adding 10 grains per inch on 2310 grains troy for the 231 inches, say as—

gr.troy.		grains troy.		grains troy.		oz.	drachms.	gr. im.
1	:	.85459 &c.	: :	2310	:	3	13	$22\frac{126}{1000}$

	oz.	dr.	gr. im.		lb.	oz.	dr.	gr. im.		lb.	oz.	dr.	gr.im.
Then	3	13	$22\frac{6}{1000}$	+	7	12	6	$27\frac{6}{10}$	=	8	0	4	$17\frac{67}{100}$

	lb.	oz.	dr.	gr. im.		cub.in. r.wine		lb.	oz.	dr.	gr. im.
And again	8	4	11	$24\frac{48}{100}$	=	231	+	7	12	6	$27\frac{54}{100}$

cub.in. brandy.		lb.	oz.	dr.	gr.im.				lb.	oz.	dr.	gr.im.
= 231 in winter	=	16	1	2	$20\frac{1}{100}$	÷	2	=	8	0	9	$10\frac{1}{10}$

[1] the average weight of wine and brandy.

So that, on the whole of the proportions, I do not perceive that any thing much nearer than 231 cubic inches in measure, and 8 pounds imperial in weight, can be fixed on as a medium proportion for one gallon of all kinds of liquors. And we know already that a Winchester wine pint of $28\frac{7}{8}$ cubic inches, will contain exactly one pound avoirdupoise of water.

I have now only to enforce, in as few words as possible, the superior simplicity and consequent utility of the tables proposed, by briefly observing that the variations from those now in legal use, are very few indeed in point of addition; but little more numerous in substitution of new and useful terms or proportions, for old and improper ones; and are most extensively operative in striking out a great number of trifling and useless divisions; which, from their extreme irregularity, and want of systematic proportion, tend only to confuse the schoolboy, and to perplex the dealer. The fundamental weights and measures now in use are still retained. The pound, ounce, and drachm, avoirdupoise, and the gallon, quart, and pint, Winchester wine measure, the most useful of all measures and weights, remain untouched: their divisions and multiples only are rendered more conformable to that perfect series of squares and cubes, on which I have before insisted, as the only solid foundation of regular proportion.

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[1] The exact average of all three, viz: of brandy in winter, and in summer, and of red wine, is still nearer, being 8 lbs. 0 oz. 7 dr. $23\frac{32}{100}$ grs. imperial.

That this series might be continued almost ad infinitum, at least, as far as can possibly be required in practice, is proved at once by recollecting that in the table of involution 16,777,216, the number of grains in a ton imperial, is the twelfth power of 4. the number of quarters of any one substantial integer.

I take my leave with referring your lordship to the annexed tables themselves for the ocular demonstration of this.

"Ipsius rei rationem reddere possis."

FALKLAND.

IMPERIAL TABLES OF WEIGHT AND MEASURE,

Proposed to be used exclusively for the sale of all such commodities as are now usually sold either by avoirdupoise, troy, or apothecaries, weights: or by wine, ale, beer, or dry measure, in the united kingdom of Great Britain and Ireland.

The whole calculated on a series of ascending and descending squares and cubes of integral numbers; which may be infinitely prolonged, (as far as the possible division or accumulation of substantial matter can render it practically necessary,) so as totally to avoid all fractional or decimal parts; and of which the present pound avoirdupoise is the regulating medium.

TABLE I.

Imperial Weight.

1 grain imperial=.8549, &c. of 1 grain troy.= 1 grain of the largest and heaviest wheat= about $1\frac{1}{7}$ of the better sort of marketable corn =about $1\frac{1}{4}$ of the average sort, and about $1\frac{1}{3}$ of inferior home-grown or foreign wheat.
32 — 1 drachm imperial=1 drachm avoirdupoise.
512 — 16 — 1 ounce imperial=1 ounce avoirdupoise.
8912 — 256 — 16 — 1 pound imperial=1 pound avoirdupoise.
131072 — 4096 — 256 — 16 — 1 stone imperial.
1048576 — 32768 — 2048 — 128 — 8 — 1 cwt. imperial.
16777216 — 524288 — 32768 — 2048 — 128 — 16 — 1 ton imperial.

TABLE II.

Imperial Dry Measure.

1 pint=1 pint Winchester wine measure, measuring $28\frac{7}{8}$ cubic inches in solid content, containing about 8192 grains of the largest and heaviest wheat or probably about 10240 of the average sort; and weighing exactly 1 pound imperial or avoirdupoise.

2 — 1 quart=1 quart Winchester wine measure.

8 — 4 — 1 gallon=1 gallon Winchester wine measure.

16 — 8 — 2 — 1 peck=1 peck Winchester.

64 — 32 — 8 — 4 — 1 bushel=1 bushel Winchester, containing 64 pints do. measuring 1848 cubic inches in solid content, and weighing 64lbs. imperial or avoirdupoise.

256 — 128 — 32 — 16 — 4 — 1 sack imperial.

512 — 256 — 64 — 32 — 8 — 2 — 1 quarter=1 quarter Winchester.

2048 — 1024 — 256 — 128 — 32 — 8 — 4 — 1 ton imperial, containing 16,777216 grains of the largest and heaviest wheat, weighing 2048 pounds imperial or avoirdupoise, containing 2048 pints imperial or Winchester, and measuring 59136 cubic inches in solid content.

TABLE III.

Imperial Liquid Measure.

1 pint imperial=1 pint Winchester wine measure; containing 1 pound imperial or avoirdupoise of pure running water, and measuring $28\frac{7}{8}$ cubic inches in solid content.

2 — 1 quart imperial=1 quart Winchester wine measure.

8 — 4 — 1 gallon imperial=1 gallon Winchester wine measure.

64 — 32 — 8 — 1 firkin imperial.

128 — 64 — 16 — 2 — 1 kilderkin imperial.

256 — 128 — 32 — 4 — 2 — 1 barrel imperial.

512 — 256 — 64 — 8 — 4 — 2 — 1 hogshead imperial.

1024 — 512 — 128 — 16 — 8 — 4 — 2 — 1 pipe imperial.

2048 — 1024 — 256 — 32 — 16 — 8 — 4 — 2 — 1 ton imperial; containing 2048 pints imperial, or Winchester wine measure: weighing 2048 pounds imperial or avoirdupoise of pure running water, and measuring in soild content 59136cubic inches.

TABLE IV.

Exhibiting in one combination the several correspondent divisions of a Ton Imperial in Weight, Dry and Liquid Measure.

grain imperial=1 grain of the largest and heaviest wheat; about 1⅐ of good wheat, 1¼ of average marketable wheat, 1⅓ of inferior home grown, or foreign wheat, and exactly .8545947965595 of one grain troy weight.	drachm imperial=one drachm avoirdupoise weight.	ounce imperial=one ounce avoirdupoise weight.	pound imperial=one pound avoirdupoise weight=one pint imperial dry or liquid measure=one wine pint Winchester measure.	half quarter stone imperial=one quart imperial dry or liquid measure=one wine quart Winchester measure.	quarter stone imperial=one half gallon imperial dry or liquid measure=one half gallon Winchester wine measure.	half stone imperial=one gallon imperial dry or liquid measure=one gallon Winchester wine measure.	stone imperial=one peck imperial dry measure=one quarter firkin imperial liquid measure.	quarter cwt. imperial=one half bushel imperial dry measure=one half firkin imperial liquid measure.	half cwt. imperial=1 bushel imperial dry measure=1 firkin imperial liquid measure.	cwt. imperial=one-half sack imperial dry measure=1 kilderkin imperial liquid measure.	half-qr. ton imperial=one sack imperial dry measure=1 barrel imperial liquid measure.	quarter ton imperial=1 quarter imperial dry measure=1 hogshead imperial liquid measure.	half ton imperial=one-half load imperial dry measure=one pipe imperial liquid measure.	ton imperial, by weight, dry, or liquid measure, weighing 2048 pounds imperial or avoirdupoise weight, containing 2048 pints imperial or Winchester wine measure, and measuring 59136 cubic inches in solid content.[1]
1														
32—	1													
512—	16—	1												
8192—	256—	16—	1											
16384—	512—	32—	2—	1										
32768—	1024—	64—	4—	2—	1									
65536—	2048—	128—	8—	4—	2—	1								
131072—	4096—	256—	16—	8—	4—	2—	1							
262144—	8192—	512—	32—	16—	8—	4—	2—	1						
524288—	16384—	1024—	64—	32—	16—	8—	4—	2—	1					
1048576—	32768—	2048—	128—	64—	32—	16—	8—	4—	2—	1				
2097152—	65536—	4096—	256—	128—	64—	32—	16—	8—	4—	2—	1			
4194304—	131072—	8192—	512—	256—	128—	64—	32—	16—	8—	4—	2—	1		
8388608—	262144—	16384—	1024—	512—	256—	128—	64—	32—	16—	8—	4—	2—	1	
16777216—	524288—	32768—	2048—	1024—	512—	256—	128—	64—	32—	16—	8—	4—	2—	1

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[1] To find the solid contents of any cylindrical measure, say, as 1 inch is to .88622692 of one inch, so is the diameter of a cylinder to one face of a square equal in superficial content to the circular superficies of the cylinder: multiply the face of the square into itself to find the number of square inches in its area; the product of which multiplied by the depth of the vessel, will give its solid contents in cubical inches.

This is the nearest solution to the squaring of the circle which has yet been found out, and sufficiently accurate for practice—vide, Chambers' Dictionary, Article Squaring of the Circle. There are also the two following proportions, viz:

1. That of Archimedes—as 7 is to 22, so is the diameter of a circle to its circumference; and half the circumference multiplied by the radius, gives the area of the circle; which multiplied by the depth as before, gives the solid contents of the cylinder.

2. That of Metius, who makes the diameter to the circumference, as 113 to 355, and then proceeds in the same manner as Archimedes.

Therefore the solid contents of the Winchester bushel, legalized in 1697, and measuring 18½ inches in diameter, by 8 inches in depth, worked according to the above proportions will give the three following different products, viz:

			cubical inches.
1st.	according to	Chambers - -	-2150.42014492.
2d.	Do.	Archimedes - -	2151.28571418.
3d.	Do.	Metius - - - - -	2150.42035374.

So that according to the proportions used by Chambers for the quadrature of the circle, which are as nearly as possible the same as those of Metius, the proposed imperial bushel, measuring 1848 cubical inches in solid content, should be 18 inches in diameter, and 7,2512 or rather more than 7¼ inches in depth, viz:

As 1 : .88622692 : : 18 : 15,95208456.

Then 15,95208456 × 15,95208456 = 254,469 × 7,2512 = 1848,004784, or sufficiently near to 1848 cubic inches for accurate admeasurement in common practice.

END OF
TITLE